

CLAIMS

We claim:

1. A water treatment system, comprising:
at least one collection device for collecting wastewater containing contaminants;
at least one disinfectant injector for injecting at least one disinfectant into the wastewater treatment system downstream of the at least one collection device;
at least one mixer for mixing an ionized gas with the wastewater;
at least one ionized gas injector coupled to the at least one mixer for injecting ionized gas into the wastewater in the at least one mixer; and
at least one dissolved air flotation unit for removing suspended solids from the wastewater using microbubbles.
2. The water treatment system of claim 1, wherein the at least one disinfectant injector further comprises a disinfectant generator for generating disinfectant materials from saltwater.
3. The water treatment system of claim 2, wherein the disinfectant generator comprises a housing containing a plurality of conduits having electrical cells for exposing electricity to saltwater flowing through the conduits.

4. The water treatment system of claim 3, wherein the disinfectant generator further comprises a single inlet coupled to a header that distributes saltwater to the plurality of conduits and at least one of the conduits has a valve upstream of an electrical cell and a valve downstream of the electrical cell.

5. The water treatment system of claim 3, wherein the disinfectant generator further comprises at least one sensor positioned downstream of an electrical cell in at least one of the plurality of conduits.

6. The water treatment system of claim 3, wherein the disinfectant generator further comprises at least one bypass conduit for controlling flow of saltwater through the conduits of the disinfectant generator.

7. The water treatment system of claim 3, wherein the disinfectant generator comprises between about four conduits and about twenty conduits, each having an electrical cell.

8. The water treatment system of claim 1, wherein the ionized gas injector comprises an ionized gas generator formed from a plurality of chambers, each chamber containing a plurality of ultraviolet lamps and each chamber adapted to allow a gas to pass through the ionized gas generator.

9. The water treatment system of claim 8, wherein the plurality of ultraviolet lamps comprise between about one ultraviolet lamp and about twenty ultraviolet lamps extending from a first end of the ionized gas generator to a second end of the generator generally opposite to the first end.

10. The water treatment system of claim 9, wherein the plurality of chambers are coupled in parallel.

11. The water treatment system of claim 9, wherein the plurality of chambers forming the ionized gas generator comprises thirty chambers.

12. The water treatment system of claim 1, wherein the dissolved air flotation unit comprises a tank comprising: an inlet positioned proximate to a bottom surface of the tank; a plurality of injectors proximate to the bottom surface of the tank for emitting ionized gas microbubbles; and at least one contaminant removal device for separating suspended solids carried to the top of the unit by the ionized gas microbubbles from the wastewater.

13. The water treatment system of claim 1, further comprising at least one filtration system upstream of the collection device for removing at least a portion of the suspended solids from the wastewater.

14. The water treatment system of claim 13, wherein the at least one filtration system comprises at least one drum screen with an automatic cleansing system.

15. The water treatment system of claim 1, further comprising at least one electrical coagulation unit for applying an electrical current to the wastewater for removing at least a portion of the suspended solids.

16. The water treatment system of claim 15, wherein the electrical coagulation unit comprises a plurality of plates positioned generally parallel to each other and including a generally serpentine flow path between the plurality of plates.

17. The water treatment system of claim 1, wherein the at least one disinfectant injector comprises at least one first disinfectant injector positioned upstream of the electrical coagulation unit and at least one second disinfectant injector positioned downstream of the at least one dissolved air flotation unit.

18. The water treatment system of claim 17, wherein the first and second disinfectant injectors positioned upstream and downstream of the electrical coagulation unit each further comprise at least one disinfectant generator for generating disinfectant materials from saltwater, each comprising a housing containing a plurality of conduits having electrical cells for exposing electricity to the water flowing through the conduits.

19. The water treatment system of claim 17, further comprising at least one contact tank downstream of the second disinfectant injector.

20. The water treatment system of claim 1, further comprising at least one ionized gas injector downstream of the at least one dissolved air flotation unit for injecting ionized gas into the water treatment system.

21. The water treatment system of claim 20, further comprising at least one contact tank downstream of the ionized gas injector that is downstream of the at least one dissolved air flotation unit.

22. The water treatment system of claim 21, further comprising at least one filter downstream of the at least one dissolved air flotation unit.

23. The water treatment system of claim 22, wherein the at least one filter is comprised of at least a duplex filter system.

24. The water treatment system of claim 1, further comprising a recirculation loop coupled to a downstream location of the water treatment system for recirculating water through the water treatment system if the water, after passing through the water treatment system, does not meet selected standards.

25. The water treatment system of claim 1, further comprising a disinfectant light source downstream of the dissolved air flotation unit.

26. The water treatment system of claim 1, further comprising an ozone generator downstream of the dissolved air flotation unit and configured to emit ozone into the water treatment system to contact the wastewater.

27. The water treatment system of claim 1, further comprising a solid waste treatment system comprising at least one separator for dewatering solids produced by the water treatment system and at least one incinerator for incinerating solids extracted from wastewater by the water treatment system.

28. The water treatment system of claim 1, further comprising at least one saturization system formed from a labyrinth of pipes upstream of the at least one dissolved air flotation unit for receiving at least one disinfectant and at least one ionized gas.

29. The water treatment system of claim 1, further comprising at least one oil/water separator for removing at least a portion of any oils present in the wastewater.

30. A water treatment system, comprising:
at least one collection device for collecting wastewater containing contaminants;
at least one filtration system upstream of the collection device for removing at least a portion of suspended solids from the wastewater;
at least one disinfectant injector for injecting at least one disinfectant into the wastewater treatment system downstream of the at least one collection device;

at least one disinfectant generator in communication with the at least one disinfectant injector for generating disinfectant materials from saltwater, the disinfectant generator comprising a housing containing a plurality of conduits having electrical cells for exposing electricity to saltwater flowing through the conduits;

at least one mixer for mixing an ionized gas with the wastewater;

at least one ionized gas injector coupled to the at least one mixer for injecting ionized gas into the wastewater in the at least one mixer;

at least one ionized gas generator formed from a plurality of chambers, each chamber containing a plurality of ultraviolet lamps and each chamber adapted to allow a gas to pass through the ionized gas generator;

at least one electrical coagulation unit for applying an electrical current to the wastewater for removing at least a portion of the suspended solids; and

at least one dissolved air flotation unit for removing suspended solids from the wastewater using microbubbles.

31. The water treatment system of claim 30, wherein the disinfectant generator further comprises a single inlet coupled to a header that distributes saltwater to the plurality of conduits and at least one of the conduits has a valve upstream of an electrical cell and a valve downstream of the electrical cell.

32. The water treatment system of claim 30, wherein the disinfectant generator further comprises at least one sensor positioned downstream of an electrical cell in at least one of the plurality of conduits.

33. The water treatment system of claim 30, wherein the disinfectant generator further comprises at least one bypass conduit for controlling flow of saltwater through the conduits of the disinfectant generator.

34. The water treatment system of claim 30, wherein the disinfectant generator comprises between about four conduits and about twenty conduits, each having an electrical cell.

35. The water treatment system of claim 30, wherein the plurality of ultraviolet lamps comprise between about one ultraviolet lamp and about twenty ultraviolet lamps extending from a first end of the ionized gas generator to a second end of the generator generally opposite to the first end.

36. The water treatment system of claim 35, wherein the plurality of chambers are coupled in parallel.

37. The water treatment system of claim 35, wherein the plurality of chambers forming the ionized gas generator comprises between about one chamber and about 90 chambers.

38. The water treatment system of claim 30, wherein the dissolved air flotation unit comprises a tank having an inlet positioned proximate to a bottom surface of the tank, a

plurality of injectors proximate to the bottom surface of the tank for emitting microbubbles, and at least one contaminant removal device for removing suspended solids carried to the top of the unit by the microbubbles from the wastewater.

39. The water treatment system of claim 30, wherein the at least one filtration system comprises at least one drum screen with an automatic cleansing system.

40. The water treatment system of claim 30, wherein the electrical coagulation unit comprises a plurality of plates positioned generally parallel to each other and including a generally serpentine flow path between the plurality of plates.

41. The water treatment system of claim 30, wherein the at least one disinfectant injector comprises at least one first disinfectant injector positioned upstream of the electrical coagulation unit and at least one second disinfectant injector positioned downstream of the at least one dissolved air flotation unit.

42. The water treatment system of claim 41, wherein the first and second disinfectant injectors positioned upstream and downstream of the electrical coagulation unit each further comprise at least one disinfectant generator for generating disinfectant materials from saltwater, each comprising a housing containing a plurality of conduits having electrical cells for exposing electricity to the water flowing through the conduits.

43. The water treatment system of claim 41, further comprising at least one contact tank downstream of the second disinfectant injector.

44. The water treatment system of claim 30, further comprising at least one ionized gas injector downstream of the at least one dissolved air flotation unit for injecting ionized gas into the water treatment system.

45. The water treatment system of claim 44, further comprising at least one contact tank downstream of the ionized gas injector that is downstream of the at least one dissolved air flotation unit.

46. The water treatment system of claim 45, further comprising at least one filter downstream of the at least one dissolved air flotation unit.

47. The water treatment system of claim 46, wherein the at least one filter is comprised of at least a duplex filter system.

48. The water treatment system of claim 30, further comprising a recirculation loop coupled to a downstream location of the water treatment system for recirculating water through the water treatment system if the water, after passing through the water treatment system, does not meet selected standards.

49. The water treatment system of claim 30, further comprising a disinfectant light source downstream of the dissolved air flotation unit.

50. The water treatment system of claim 30, further comprising an ozone generator downstream of the dissolved air flotation unit and configured to emit ozone into the water treatment system to contact the wastewater.

51. The water treatment system of claim 30, further comprising a solid waste treatment system comprising at least one separator for dewatering solids produced by the water treatment system and at least one incinerator for incinerating solids extracted from wastewater by the water treatment system.

52. The water treatment system of claim 30, further comprising at least one saturization system formed from a labyrinth of pipes upstream of the at least one dissolved air flotation unit for receiving at least one disinfectant and at least one ionized gas.

53. The water treatment system of claim 30, further comprising at least one oil/water separator for removing at least a portion of any oils present in the wastewater.

54. A method of removing contaminants from wastewater, comprising:
collecting the wastewater in a collection device;
injecting at least one disinfectant into the wastewater;

injecting at least one ionized gas into the wastewater contained in at least one mixer adapted for mixing an ionized gas with the wastewater; and

passing the wastewater through at least one dissolved air flotation unit for removing suspended solids from the wastewater using microbubbles.

55. The method of claim 54, further comprising generating at least one disinfectant using saltwater and at least one disinfectant generator comprising a housing containing at least one conduit having an electrical cell for exposing electricity to saltwater flowing through the at least one conduit.

56. The method of claim 55, wherein generating the at least one disinfectant comprises receiving saltwater from a body of water, passing the saltwater through at least one conduit including at least one electrical cell, and imparting electricity to at least a portion of the saltwater passing through the disinfectant generator.

57. The method of claim 54, further comprising passing the wastewater through at least one electrical coagulation unit for applying an electrical current to the wastewater for coagulating at least a portion of suspended solids.

58. The method of claim 57, wherein passing the wastewater through at least one electrical coagulation unit comprises passing the wastewater along a generally serpentine flow path between a plurality of plates positioned generally parallel to each other.

59. The method of claim 57, further comprising passing solids generated by the at least one electrical coagulation unit, the at least one filtration system, and the at least one dissolved air flotation unit through a solid waste treatment system comprising at least one separator for dewatering solids and at least one incinerator for incinerating the solids.

60. The method of claim 54, further comprising generating at least one ionized gas.

61. The method of claim 60, wherein generating the at least one ionized gas comprises passing a gas through at least one ionized gas generator comprising a plurality of chambers, wherein at least one chamber contains a plurality of ultraviolet lamps and each chamber is adapted to allow a gas to pass through the ionized gas generator.

62. The method of claim 54, further comprising passing wastewater through at least one filtration system upstream of the collection device for removing at least a portion of suspended solids from the wastewater.

63. The method of claim 62, wherein passing wastewater through the at least one filtration system comprises passing wastewater through at least one drum screen having an automatic cleansing system.

64. The method of claim 54, wherein injecting the at least one disinfectant into the wastewater comprises injecting the at least one disinfectant into the wastewater upstream and downstream of the at least one dissolved air flotation unit.

65. The method of claim 54, further comprising passing the wastewater through at least one contact tank downstream of the at least one dissolved air flotation unit.

66. The method of claim 54, further comprising injecting at least one ionized gas into the wastewater upstream and downstream of the at least one dissolved air flotation unit.

67. The method of claim 54, further comprising injecting at least one ionized gas into the at least one dissolved air flotation unit.

68. The method of claim 54, further comprising passing the wastewater through at least one filter downstream of the at least one dissolved air flotation unit.

69. The method of claim 54, further comprising passing the wastewater through a recirculation loop coupled to the water treatment system downstream of the dissolved air flotation unit for recirculating water through the water treatment system if the water, after passing through the water treatment system, does not meet selected standards.

70. The method of claim 54, further comprising passing the wastewater past a disinfectant light source downstream of the dissolved air flotation unit.

71. The method of claim 54, further comprising generating ozone using an ozone generator and injecting the ozone into the wastewater downstream of the dissolved air flotation unit.

72. The method of claim 54, further comprising passing the wastewater through at least one oil/water separator to remove at least a portion of any oils in the wastewater.